

REMARKS

Claims 1-11 are pending in this application. Claim 10 has been withdrawn from consideration. Claims 1-9 and 11 have been rejected under 35 USC §112, second paragraph. However, Claim 1 has now been amended to specify a number average molecular weight of from 500 to 5000 dalton by cationic polymerization of isobutene in the liquid phase. Support for this limitation may be found on page 6, lines 32-35. Accordingly, applicants respectfully request the rejection be withdrawn.

Furthermore, the examiner has rejected claim 11 under 35 USC §112, second paragraph. The examiner argues that it is not clear what R¹ is when R² is methyl or ethyl. However, R¹ has been defined in the claim and continues to be defined as a primary or secondary alkyl group having 3-10 carbon atoms. When examining a claim for compliance with 35 USC §112, second paragraph, the examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the notice function. Solomon v. Kimberly Clark Corp.

216 F.3d 1372, 1379, 55 USPQ 2d 1279, 1283 (Fed. Cir. 2000); MPEP §2173.02.

Furthermore, the essential inquiry into whether claim language meets the definiteness requirement must be analyzed, not in a vacuum, but in light of the application disclosure; teachings of the prior art; and claim interpretation of one of ordinary skill in the art. MPEP §2173.02. Claim 11 is intended to cover an additional embodiment wherein R² is methyl or ethyl as described in the specification on page 7, lines 31-37. Therefore, applicants respectfully assert that the claim language is definite when the

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for alkyl

claim is considered as a whole in light of the specification. Applicants' respectfully request the rejection be withdrawn.

The examiner has rejected claims 1-9 and 11 under 35 USC §103 as unpatentable over Rath (US 5,408,018) (referred to as the '018 patent). Applicants herewith submit the declaration of Dr. Hans Peter Rath previously submitted January 16, 2003. This declaration contains evidence of unexpected results as submitted in applicants submissions of December 6, 2003, and January 16, 2003, however, it appears not to have been previously considered by the examiner in declaration form.

was not in the case at the time the trial was misplaced in a wrong case

The examiner argues that the unexpected results are not based on the closest prior art as cited by the examiner. Additionally, the examiner argues that Rath teaches a tertiary alkyl group containing ether is preferred, and does not exclude the dialkyl ether which does not contain a tertiary alkyl group. In support of this argument, the examiner cites example 8 of the '018 patent (column 13, lines 39-42). This example discloses a process utilizing di-n-butyl ether resulting in isobutene conversion of 76% with terminal double bonds of 80 mol%. However, examples 1-6 of the instant invention disclose a reactivity (double bond content of) 91.7 to 97 mol% (page 13-14 of the instant disclosure). In light of the unexpected results, the instant process would not have been obvious to one of ordinary skill in the art. Proof of an unexpected improvement may rebut a *prima facie* case of obviousness. *In re Murch*, 464 F.2d 1051, 175 USPQ 89 (CCPA 1972). Indeed, it is always error to exclude evidence of secondary indicators. *Stratoflex v. Aeroquip Corp.*, 713 F.2d 1540, 218 USPQ 871

(Fed. Cir. 1983). Applicants assert that the examiner has failed to establish a *prima facie* case of obviousness. Alternatively, if a *prima facie* case of obviousness has been established, the unexpected improvements as disclosed in the specification and the affidavit provided herein have overcome the rejection.

In view of the foregoing amendments and remarks, applicants consider that the rejections of record have been obviated and respectfully solicit passage of the application to issue.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees to Deposit Account No. 11-0345. Please credit any excess fees to such deposit account.

Respectfully submitted,
KEIL & WEINKAUF

A handwritten signature in black ink, appearing to read 'Lesley E. Shaw', with a long horizontal flourish extending to the right.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Amend claims 1 and 11 as follows:

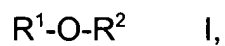
1. (currently amended) A process for preparing highly reactive polyisobutenes having a terminal vinylidene group content of more than 80 mol% and ~~an~~ a number average molecular weight of from 500 to 5000 dalton by cationic polymerization of isobutene in the liquid phase in the presence of a complex comprising boron trifluoride at from +40°C to -60°C, which comprises polymerizing in the presence of a complex comprising boron trifluoride and
- a) a primary alcohol having 1-20 carbon atoms or a secondary alcohol having 3-20 carbon atoms, or a mixture of these alcohols, and
 - b) an ether containing no tertiary alkyl groups and having the formula I



where R^1 and R^2 are primary or secondary alkyl groups having 3-10 carbon atoms, with the proviso that at least one of R^1 and R^2 is a secondary alkyl group.

11. (currently amended) A process for preparing highly reactive polyisobutenes having a terminal vinylidene group content of more than 80 mol% and ~~an~~ a number average molecular weight of from 500 to 5000 dalton by cationic polymerization of isobutene in the liquid phase in the presence of a complex comprising boron trifluoride at from +40°C to -60°C, which comprises polymerizing in the presence of a complex comprising boron trifluoride and

- a) a primary alcohol having 1-20 carbon atoms or a secondary alcohol having 3-20 carbon atoms, or a mixture of these alcohols, and
- b) an ether containing no tertiary alkyl groups and having the formula I



where R^1 and R^2 are primary or secondary alkyl groups having 3-10 carbon atoms, with the proviso that at least one of R^1 and R^2 is a secondary alkyl group, or R^2 is methyl or ethyl.

COMPLETE LISTING OF ALL CLAIMS IN THE APPLICATION

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1. (currently amended) A process for preparing highly reactive polyisobutenes having a terminal vinylidene group content of more than 80 mol% and a number average molecular weight of from 500 to 5000 dalton by cationic polymerization of isobutene in the liquid phase in the presence of a complex comprising boron trifluoride at from +40°C to -60°C, which comprises polymerizing in the presence of a complex comprising boron trifluoride and

- a) a primary alcohol having 1-20 carbon atoms or a secondary alcohol having 3-20 carbon atoms, or a mixture of these alcohols, and
- b) an ether containing no tertiary alkyl groups and having the formula I



where R^1 and R^2 are primary or secondary alkyl groups having 3-10 carbon atoms, with the proviso that at least one of R^1 and R^2 is a secondary alkyl group.

- 2. (original) A process as claimed in claim 1, wherein the secondary alcohol a) used is isopropyl alcohol and/or 2-butanol.
- 3. (original) A process as claimed in claim 1, wherein the ether b) used is diisopropyl ether, di-sec-butyl ether and/or isopropyl sec-butyl ether.
- 4. (original) A process as claimed in claim 1, wherein the primary and/or secondary alcohol a) and the ether b) are used in a molar ratio of from 0.01:1 to 10:1.
- 5. (original) A process as claimed in claim 1, wherein the primary and/or secondary alcohol a) and the ether b) are used in a molar ratio of from 0.02:1 to 2:1.

6. (original) A process as claimed in claim 1, wherein boron trifluoride, primary and/or secondary alcohol and ether are combined in the polymerization reactor to generate the complex in situ in the polymerization mixture.
7. (original) A process as claimed in claim 1, wherein the boron trifluoride/ether complex is preformulated and is introduced, together with the primary and/or secondary alcohol or separately, into the solvent or monomer feed to the reactor or directly into the reactor.
8. (original) A process as claimed in claim 1, wherein polyisobutenes having a terminal vinylidene group content of more than 90 mol% are polymerized at an isobutene conversion of up to 95% using a preformed boron trifluoride/isopropanol/diisopropyl ether complex, a molar secondary alcohol/ether ratio of from 2:1 to 1:5 and a boron trifluoride/diisopropyl ether ratio of from 0.6:1 to 0.9:1.
9. (original) A process as claimed in claim 1, wherein the isobutene source is a C₄ cut comprising isobutene in an amount of at least 6% by weight.
10. (withdrawn) A polyisobutene having an average molecular weight of from 500 to 5000 dalton and a terminal vinylidene group content of more than 90%, obtainable by cationic polymerization of isobutene in the liquid phase with the aid of boron trifluoride as catalyst at from 40°C to -60°C in the presence of a boron trifluoride complex with
 - a) a primary alcohol having 1-20 carbon atoms or a secondary alcohol

having 3-20 carbon atoms, or a mixture of these alcohols, and

- b) an ether containing no tertiary alkyl groups and having the formula I



where R^1 and R^2 are primary or secondary alkyl groups having 3-10 carbon atoms, with the proviso that at least one of the radicals R^1 and R^2 is a secondary alkyl group.

11. (currently amended) A process for preparing highly reactive polyisobutenes having a terminal vinylidene group content of more than 80 mol% and a number average molecular weight of from 500 to 5000 dalton by cationic polymerization of isobutene in the liquid phase in the presence of a complex comprising boron trifluoride at from $+40^\circ\text{C}$ to -60°C , which comprises polymerizing in the presence of a complex comprising boron trifluoride and

- B²
- a) a primary alcohol having 1-20 carbon atoms or a secondary alcohol having 3-20 carbon atoms, or a mixture of these alcohols, and
- b) an ether containing no tertiary alkyl groups and having the formula I



where R^1 and R^2 are primary or secondary alkyl groups having 3-10 carbon atoms, with the proviso that at least one of R^1 and R^2 is a secondary alkyl group, or R^2 is methyl or ethyl.
